

# **ROLE OF SCIENCE AND TECHNOLOGY IN VACCINE DEVELOPMENT FOR INFECTION DISEASE PREVENTION AND CONTROL IN VIETNAM**

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# Vaccines that save children

- The World Health Organization estimates that every year vaccination saves the lives of *three million children* throughout the world.
- Another *two million children* die because they don't have access to existing vaccines.
- Vaccination has had a significant impact on the reduction of mortality.
- 100 hundred years ago infectious diseases were the main cause of mortality, even in the most developed countries.
- Vaccine research, in the prevention and control of both communicable and non-communicable diseases, has made a vital contribution to National and International health development during the 20th century.
- The twentieth century has witnessed unprecedented progress in immunization. *At least 22 new vaccines* have been introduced since the end of the Second World War.

# Vaccines that save children

- Today vaccination can *prevent 26 infectious diseases* and holds the promise of preventing many more.
- Neither the eradication of *smallpox*, nor the progress towards eradicating *poliomyelitis*, would have been achieved without vaccine research
- Currently several hundred research projects to develop new vaccines are being carried out worldwide.
- It is estimated that *over US\$ one billion* are invested annually in vaccine research and development global, split almost equally between public and private sectors (Advisory Committee and Health Research).

# Vaccination saves lives

- 3,000,000 deaths prevented every year worldwide
- 750,000 children around the world saved from disability every year.
- 70 to 80% drop in mortality due to influenza among senior citizens.
- 85% decrease in meningococcal C infections (meningitis and septicemia) in England.
- 87% decrease in *Haemophilus influenzae* type b meningitis between 1991 and 1997 in France.

# VACCINE PRODUCTION FACILITIES IN VIETNAM



- **POLIOVAC** (The Scientific Center for Polio Vaccine Production)
- **VABIOTECH** (The company for vaccine and biological production No.1, National Institute of Hygiene and Epidemiology)
- **CENCOBI** – National Center for quality control of Medicobiological products (NRA)
- **IVAC** (The Vaccine Institute, Nha Trang – DaLat)
- **Pasteur Institute** – Ho Chi Minh City.

# The local vaccines protect Vietnamese children

There are four major production facilities in Viet Nam: POLIOVAC, IVAC, VABIOTECH and the Pasteur Institute

## **POLIOVAC (The Scientific Center for Polio Vaccine Production)**

- Polio vaccine has been produced in Viet Nam since 1962 with technology transfer from Russia. In 1993, after the visit of a WHO team, there was technology transfer to POLIOVAC from Japan. WHO has provided technical support to POLIOVAC as well.

## The local vaccines protect Vietnamese children

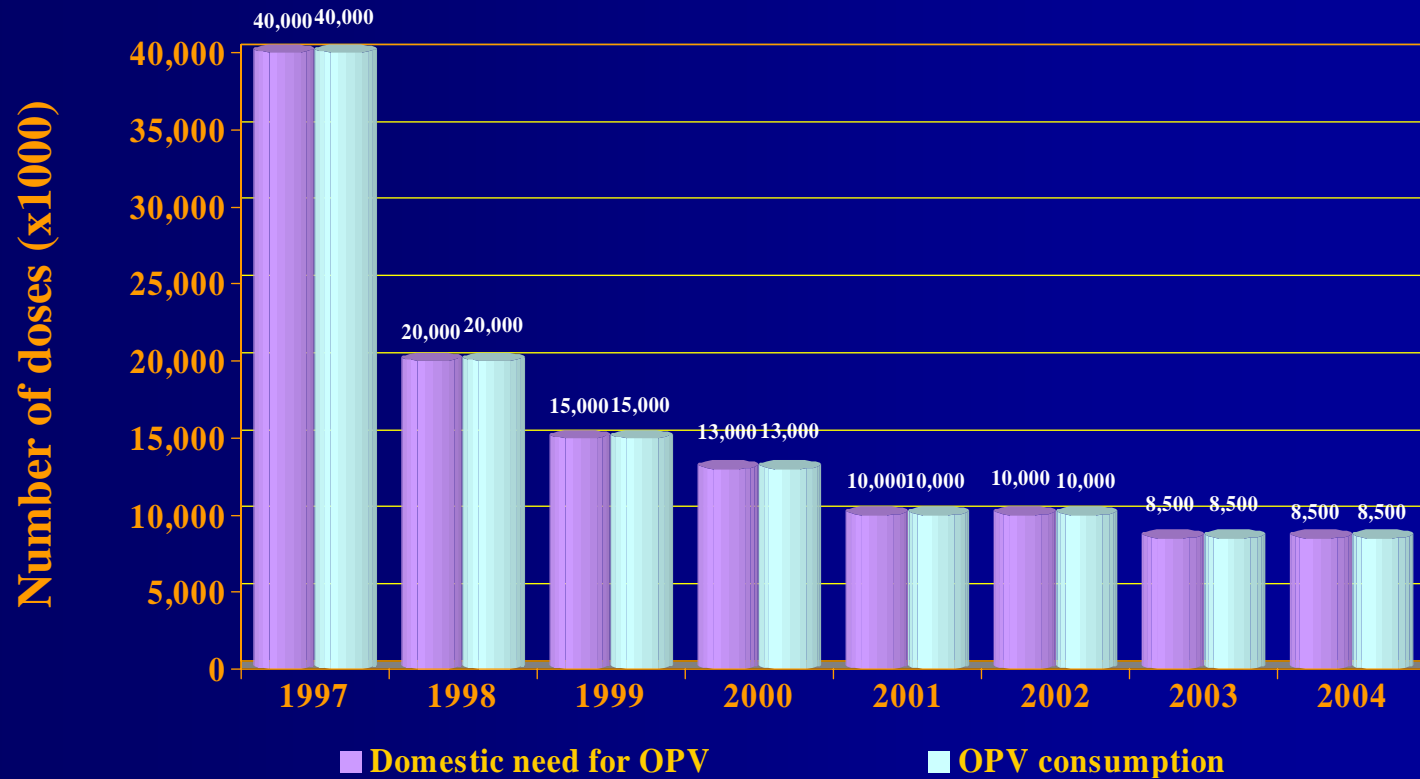
- As a result of obtaining new polio vaccine seeds and technical assistance in the neurovirulence testing of vaccines produced from these seeds from Japan, POLIOVAC has been able to produce large quantities of polio vaccine to meet Viet Nam's needs for OPV for polio eradication.
- From 1995 to 1997 they have released about 80 million doses: 18 M produced in 1993-94, 14 M in 1995, 26 M in 1996, and 40 M in 1997. In 1997, 103 final lots were produced at 400,000 doses per lot.

# The local vaccines protect Vietnamese children

- The Polio vaccine have been provided to the National vaccination program by the Vietnamese Government free of charge to Vietnamese children and save their live.
- Polio Eradication in Vietnam was successfully done by using the Polio vaccine produced in Vietnam in the year 2000.
- Recently POLIOVAC is conducting two National Projects on Researching and Development of the new vaccines: IPV (inactivated polio vaccine and Rotavirus vaccine) (financed by VN MOH and MOST).



# OPV PRODUCTION - POLIOVAC

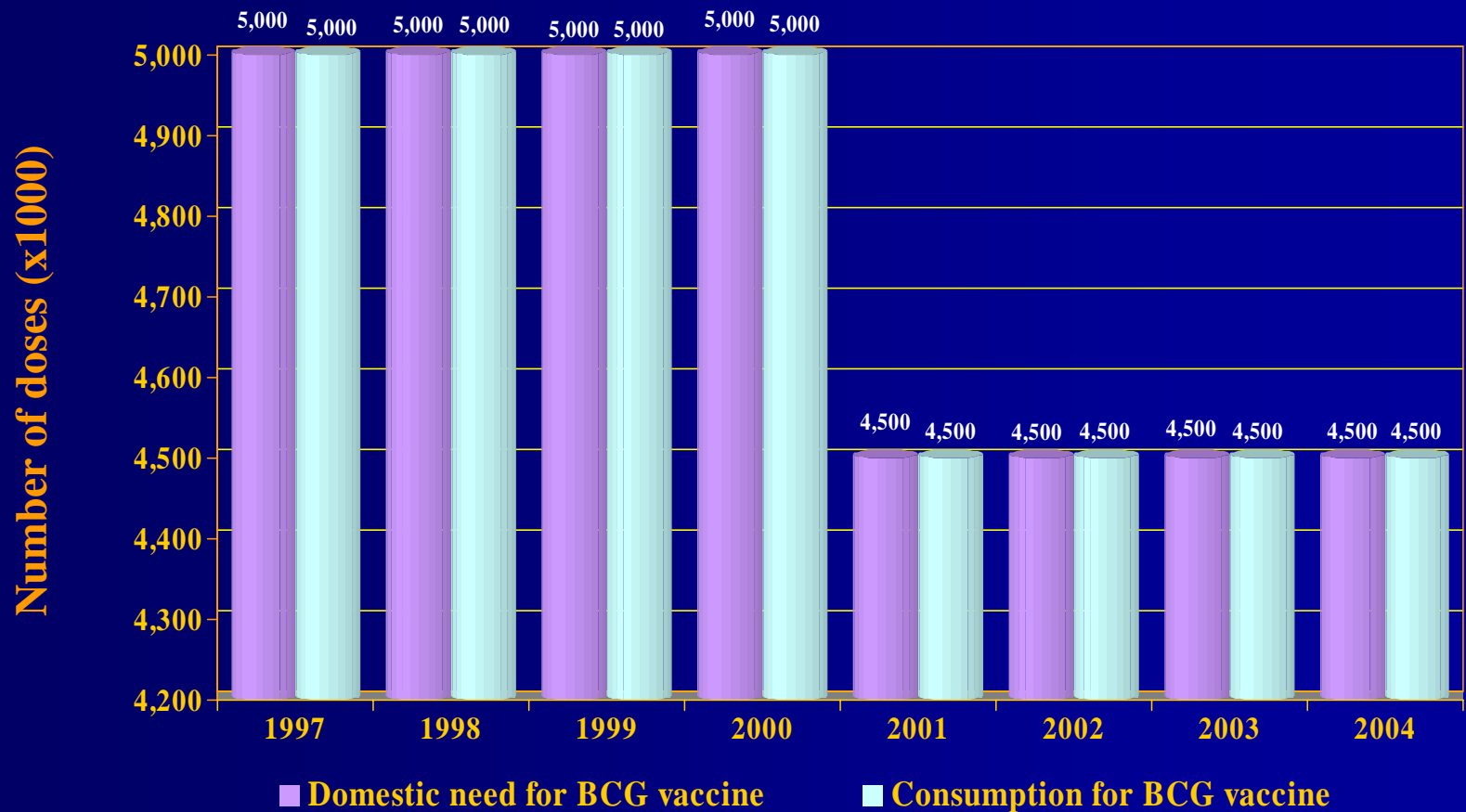


# The local vaccines protect Vietnamese children

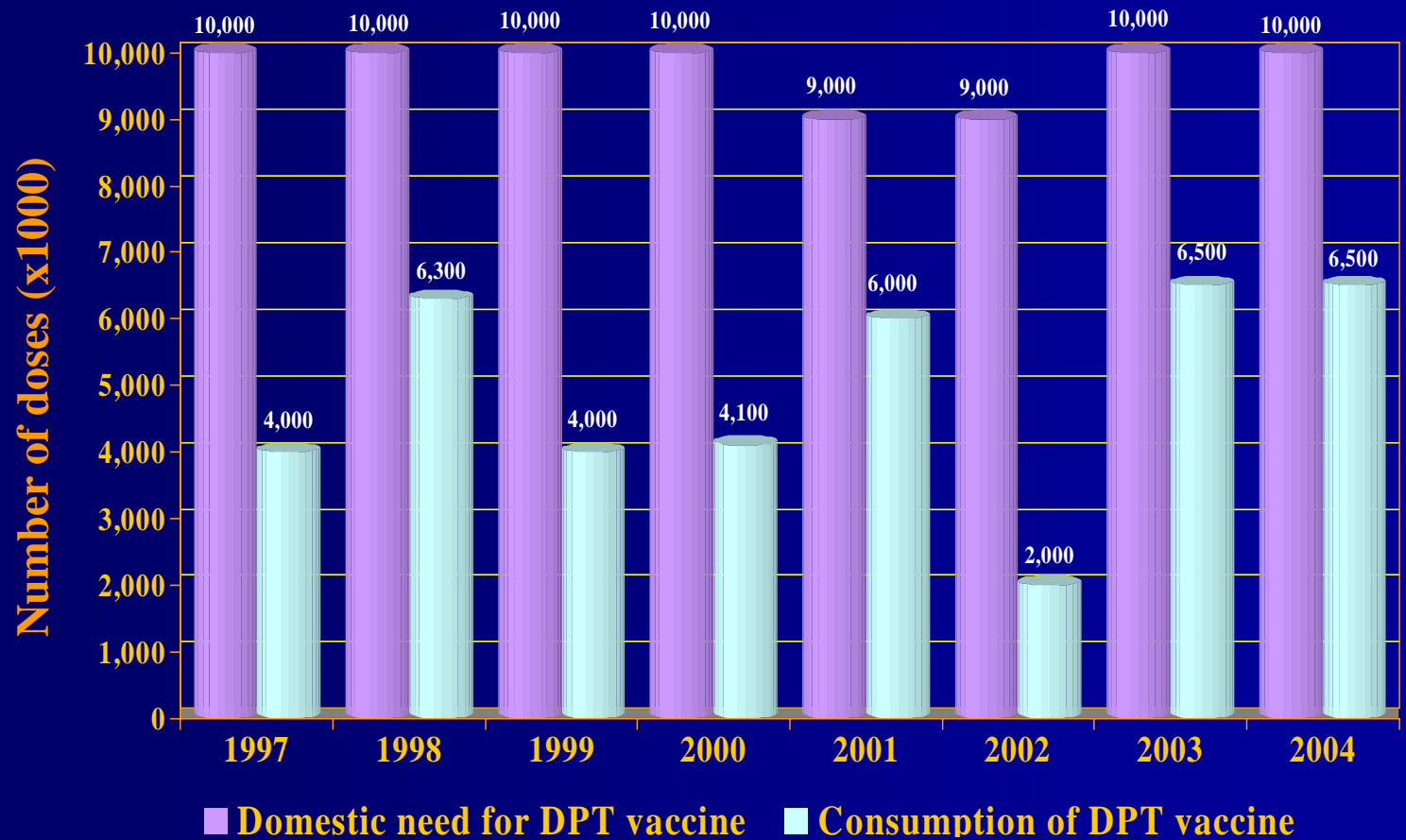
## IVAC (The Vaccine Institute, Nha Trang – DaLat)

- Produces the DTP group of vaccines, BCG vaccine, and rabies vaccine in suckling mouse brain since 1978. Sources of support to IVAC include WHO, UNICEF, and the RIVM and BioFarma through a tripartite relationship.
- Produces the group of anti-sera: tetanus, diphtheria, rabies and venom.
- The newly licensed Typhoid Vi vaccine through technology transfer from the NIH USA at IVAC's Dalat site was developed and produced since 2002.
- DTP, BCG and AT vaccines have been provided to EPI since 1980 and covered about more than 80% of the domestic demand.

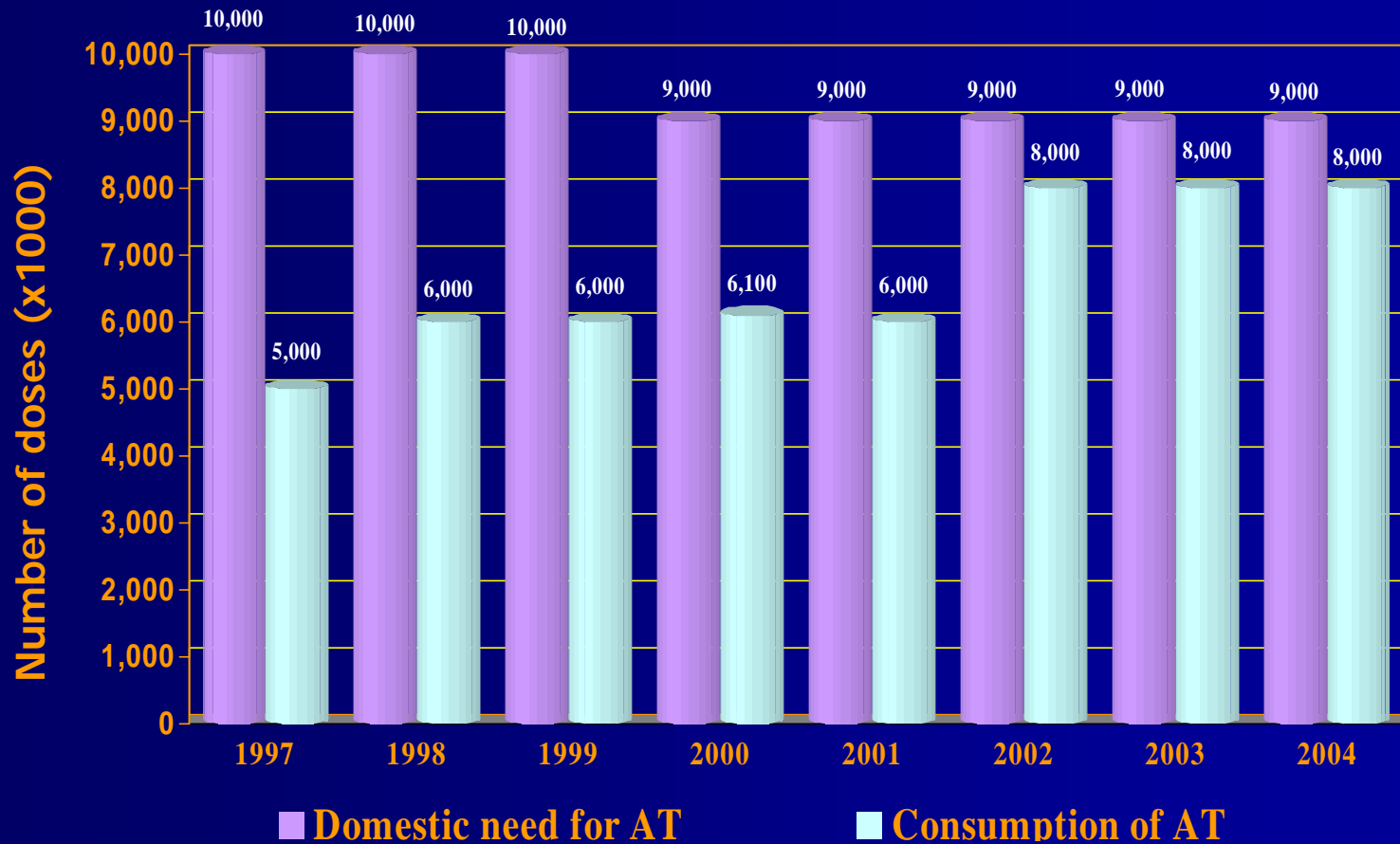
# BCG VACCINE PRODUCTION (IVAC)



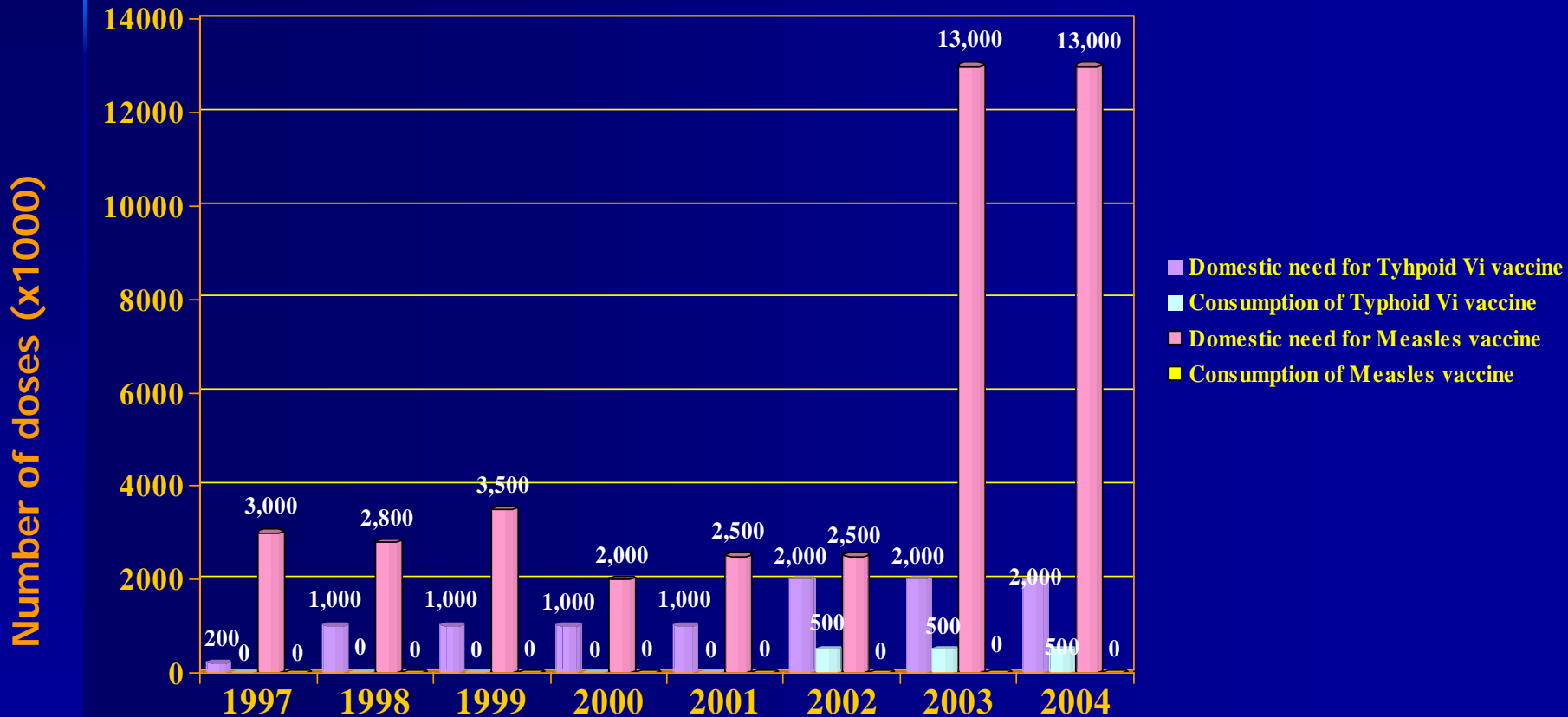
# DPT VACCINE PRODUCTION (IVAC)



# PRODUCTION OF AT VACCINE (IVAC)



# MEASLES AND TYPHOID Vi VACCINE PRODUCTION (IVAC)



# The local vaccines protect Vietnamese children

## **VABIOTECH (The company for vaccine and biological production No.1, National Institute of Hygiene and Epidemiology)**

- Produces Hepatitis B vaccine (both human plasma derived and recombinant); Japanese encephalitis vaccine (Mice brain derived-Nakayama strain); Oral whole cell cholera vaccine; Rabies vaccine (suckling mice brain derived) vaccine; Hepatitis A inactivated vaccine (Tissue culture).
- During the last 10 years, with the support from the Ministry of Health (MOH), Ministry of Science and Technology (MOST), VABIOTECH has been successful in conducting several National R&D Subjects and were highly appreciated and brought about wide-ranged Socio-Economic effectiveness in the Strategy of Control and Prevention of some infection disease in Vietnam :

# R & D Activities in new vaccine development

- The National R&D Subject coded KY-01-05 under The National Scientific Research Program KY-01 titled *"Technology for Production and Efficacy of Diagnostic Kit HBsAg Micro-Elisa and Plasma Derived Hepatitis B vaccine"*.
- The National R&D Subject coded KY-01-04 under The National Scientific Research Program KY-01 titled *"Perfection of Technology for production of Japanese Encephalitis vaccine and Diagnostic Kit for detection of Japanese Encephalitis virus and Dengue fever"*.
- The National Scientific Research Program KY-01-03 under The National Scientific Research Program KY-01 titled *"Apply advanced technology for perfection of Production procedure of Oral cholera vaccine"*.



# R & D Activities in new vaccine development

To be successful in doing this, the scientific researchers have conducted a series of studies on the followings:

- Study for a Technology Transfer on The Production of *Plasma Derived Hepatitis B Vaccine* and Diagnostic Kit HBsAg Micro-Elisa from Centers for Diseases Control & Prevention (CDC, Atlanta, USA) and The KITASATO Institute, Tokyo Japan, 1992-1995.
- Study for a Technology Transfer on The Production of *Japanese Encephalitis Vaccine* and Diagnostic Kit for detection of Japanese Encephalitis virus and Dengue fever" from Biken Institute, Osaka, Japan (1990-1993).

# R & D Activities in new vaccine development

- Study for a Technology Transfer on The Production of *Oral Cholera vaccine* from State Bacteriology Laboratory, Sweden (1990).
- Apply The above mentioned Technologies in Vietnam Production Conditions with a numbers of initiatives and creation in each step of Production Process in order to produce the product with high quality and meet all WHO's and Japanese Requirement for this vaccine.
- Have been successfully produced Hepatitis B vaccine, JE and Cholera vaccines and supplied for The National EPI for Immunization of new born. Millions doses of each vaccine were produced and supplied for domestic demand and for The National EPI Program since 1997.

## R & D Activities in new vaccine development

- September 4, 1997 The vaccines were licensed under The Decision of Ministry of Health.
- August 18, 1997 Government decided to introduce the vaccines into The National EPI Program for free of charge vaccination of new born.
- 1996-1998, Based on feasibility study and the important of the vaccines for prevention of Vietnamese children, Ministry of Science and Environment continues to support and invests for National Pilot Production Projects coded KHCVN-11-DA1, KHCVN-11-DA2 and DA1 for scaling up the production capacity of each vaccine.

# R & D Activities in new vaccine development

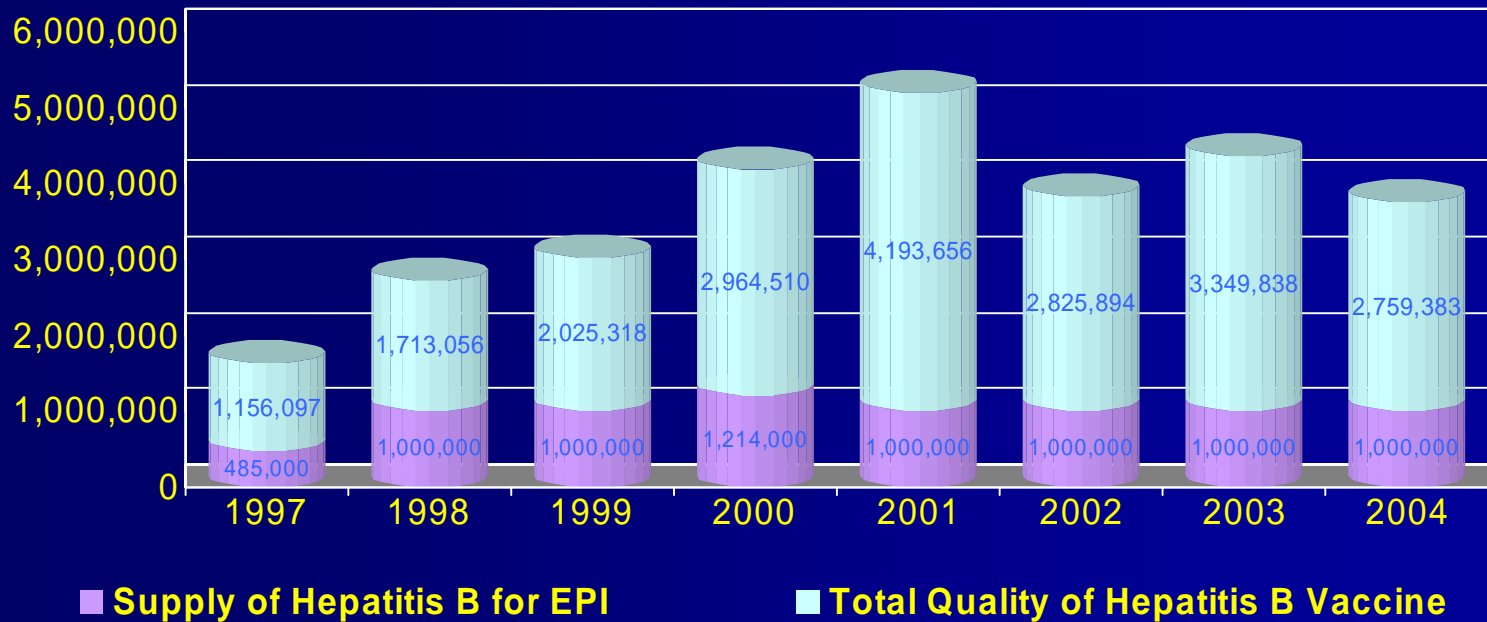
- Parallel with the study on vaccine production, the scientific researchers and Ph.D candidates as well have conducted studies on the other not less important aspect which is an establishment of epidemiological maps of HBV, JE and Cholera infection in Vietnam in order to describe epidemiological characteristics on HBV, JE and cholera for each geographical region in the whole country, in the different population and age groups.
- The results of these studies will be a basic for a policy maker on Hepatitis B, JE and Cholera vaccination with optimal effectiveness in order to eliminate and change the model of this disease in our Country.

# R & D Activities in new vaccine development

- The quantity of plasma for human plasma derived hepatitis B vaccine will be not enough for the production demand in the future.
- Recognizing the seriousness and importance of this matter together with the advance of Modern techniques in Science and Technology nowadays on applying genetic engineering into Biotechnology with aim to creative actively wishful products, with this direction and International collaboration within the past years and the support from MOH, MOST, our Laboratory was selected to develop The National R&D Subject coded KHCN-11-10 *"A study on Technology transfer for establishing technology for production of Hepatitis A vaccine and Recombinant Hepatitis B Vaccine "* in the period 1996-2001.

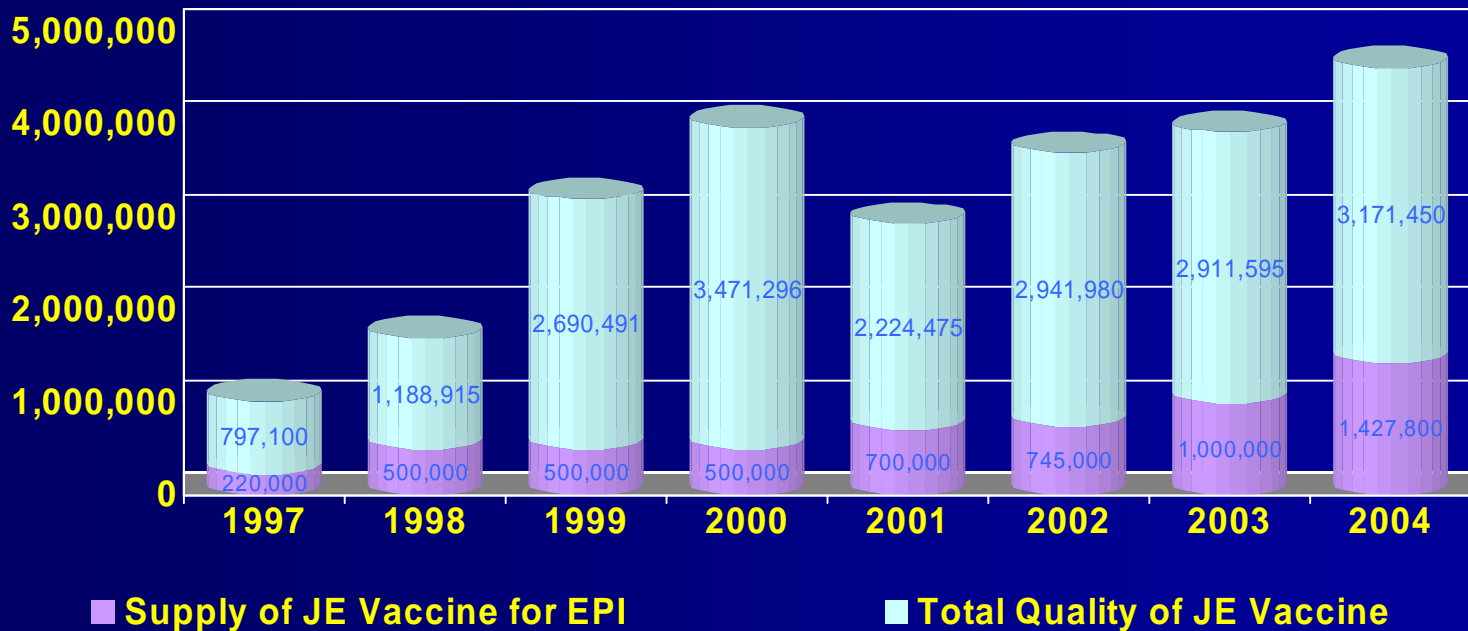
# Consumption of Hepatitis B vaccine (VABIOTECH)

## Hepatitis B Vaccine



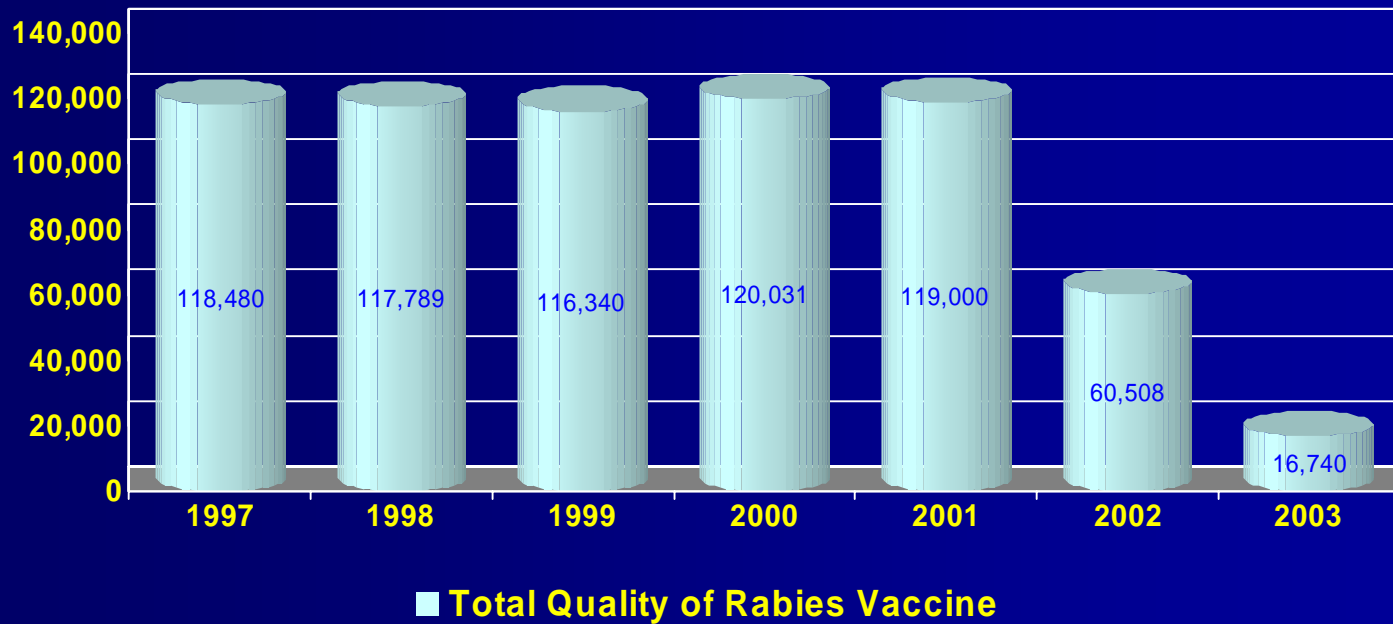
# Consumption of Japanese Encephalitis (VABIOTECH)

## Japaness Encephalitis



# Consumption of rabies vaccine (VABIOTECH)

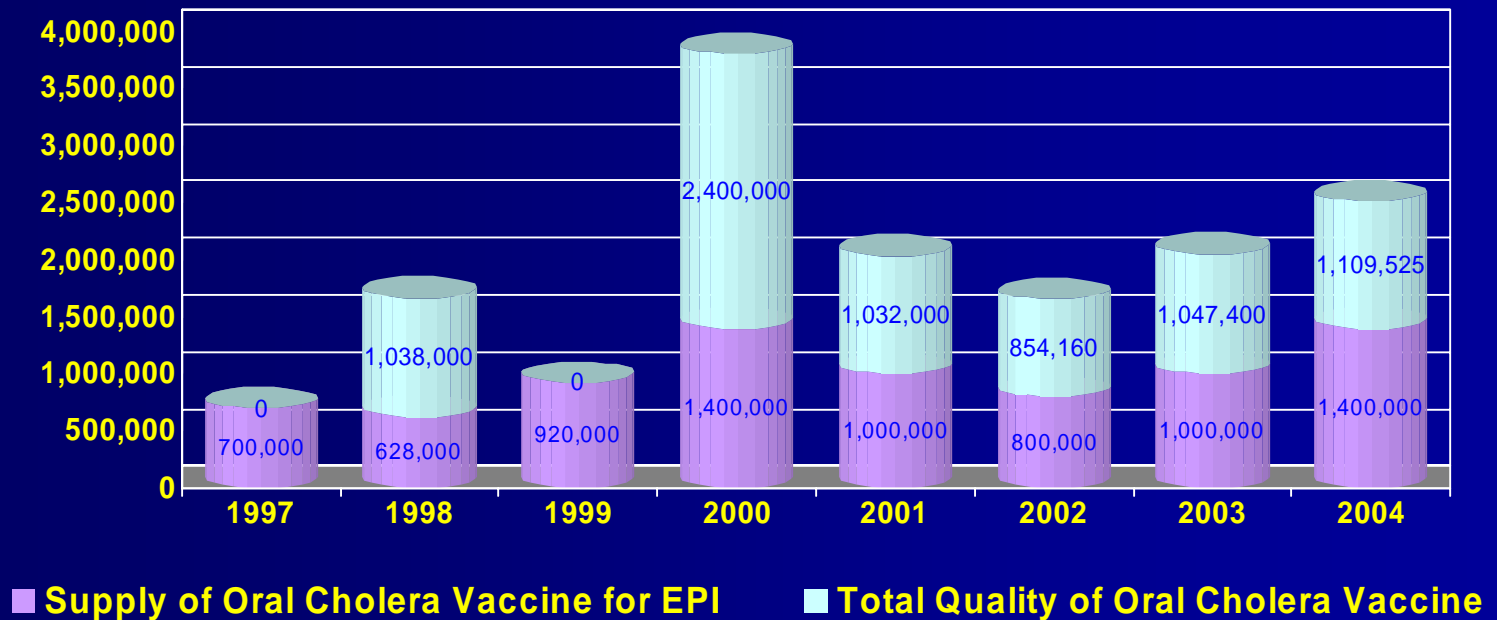
## Rabies





# Consumption of Oral cholera vaccine (VABIOTECH)

## Oral Cholera



# R & D Activities in new vaccine development



Xét nghiệm chẩn đoán  
HBV-ADN  
bằng phương pháp PCR  
*Detecting HBV - DNA by PCR  
(polymerase chain reaction)*

Kiểm tra hiệu giá các  
phần đoạn HBsAg  
thu được sau khi  
siêu ly tâm phân vùng.  
*Titration of HBsAg positive  
fractions after size - zonal step*



Xét nghiệm chẩn đoán các  
virút viêm gan bằng những  
phương pháp hiện đại và  
chuẩn thức.  
*Diagnosis of hepatitis viruses by  
the most recent and standard  
methods*



Chuẩn độ hiệu giá  
virút viêm gan A  
*Titration of HAV by plaque  
forming method*

Theo dõi nuôi cấy  
virút viêm gan A  
trên tế bào trong  
quá trình sản xuất  
vắcxin viêm gan A  
bất hoạt

*In - process control  
of inactivated  
HAV vaccine production*



# R & D Activities in new vaccine development

- Following this direction, a number of studies has been conducted and emphasized on genetic engineering, cloning and high Tech level of nowadays Biotechnology.
- The scientific researchers have been trained and retrained in the country and abroad in these fields of Science.
- The National R&D Subject KHCN-11-10 was performed within a period of 5 years from 1996 – 2001 with a large amount of work and with a collaboration between Scientific and Research Institutions (Military Medical Academy, National Center for Medico-Biological Quality Control, Scientific Center for Production of Polio Vaccine, Institute of Clinical Medicine and Tropical Disease...).

# R & D activities in new vaccine development

- The Project has been achieved the proposed goal and approved on March 26, 2002 with a quantity of product is 20,000 doses of Recombinant Hepatitis B vaccine and 24,000 doses of hepatitis A vaccine which meet the International Minimum Requirement for these vaccines, and it was excellently evaluated by The National Committee for Evaluation, and also has been proposed to be supported again by The Government for the next step of development - Pilot Production Project:

*1/ "Improve the Technology Production Process for The Inactivated Hepatitis A Vaccine in large scale" and;*

# R & D Activities in new vaccine development

*2/ "Improve The Technology Production Process for The Recombinant Hepatitis B Vaccine Derived from Yeast Pichia pastoris in large scale".*

- Another National R&D Subject coded KC-10-22 have been launch as *"Study to replace the Nakayama strain by Beijing I strain for production of The Japanese Encephalitis vaccine"* which will have a technology for production of Japanese encephalitis vaccine with higher production yield.

# The investment for the new projects for vaccine production in Vietnam from Vietnamese Government

In the near future, VABIOTECH is intending to expand the production of HB vaccine, JE vaccine, Oral cholera vaccine, Rabies vaccine and biological as well for new potential markets outside Vietnam after completion the New Building for Vaccine Production Plants under EDCF Loan from Korea Government with the *"The five vaccine production Project in Vietnam"*, which includes HB, JE, Cholera, Rabies and Typhoid Vi vaccines with the capacities meet the domestic need and export:

- Hepatitis B recombinant: 20 M/year.
- Japanese encephalitis: 4 M/year.
- Oral cholera: 10 M/year.
- Rabies: 0,3 M/year
- Typhoid Vi 10 M/year.



# The five vaccine production Project in Vietnam (Hanoi facility: HB, JE, Cholera and Rabies)



# Dalat Facility for Typhoid Vi





# Project for New Vaccines GMP Standard

## General Information:

- **Project Title:** The New Vaccines Production - GMP Standard Project
- **Project owner:** The Company for Vaccine and Biological Production No.1
- **Location:** Quang Minh Industrial Zone - Vinh Phuc Province
- **Fund resource:** Vietnamese Government
- **Total budget:** 40,000,000 USD
- **Project Period:** 2005 - 2010

# Project for New Vaccines GMP Standard

## Products & Capacity:

- Hepatitis A Vaccine: 6 M doses /year
- Mumps Vaccine: 6 M doses /year
- Rubella: 6 M doses/year
- Varicella Vaccine: 6 M doses/year
- Hib Vaccine: 6 M doses/year
- Erythropoietin: 1 M vials/year
- Alpha Interferon: 0.5 M vials/year

## Equipment:

To satisfy strict standard of GMP and other requirements of WHO, the equipment will be imported, purchased and comprehensive installed.



# Project for New Vaccines GMP Standard

## General Information:

**Project Title:** Construction of Measles Vaccine Plant in Vietnam

**Project owner:** POLIOVAC

**Location:** Thanh Tri–Hoang Mai Dist,  
Hanoi – Vietnam

**Fund resource:**

Japanese Government

**Total budget:** 22,000,000 USD

**Project Period:** 2004 – 2007

**Capacity:** 7,5 M doses/year



# Project for measles vaccine in Vietnam

## MEASLES VACCINE PRODUCTION FACTORY



# Looking Ahead

In the near future, Vietnam is intending to expand the production of HB, JE, Oral Cholera, Rabies Vaccine (tissue culture), Rubella, Mumps, Varicella, Hib Vaccines, Flu vaccines including Avian flu H5N1 vaccine and biologicals to cover whole domestic need and for new potential markets outside Vietnam.

By regular investing in important technologies such as freeze-drying, genetic engineering, animal breeding techniques, quality control, laboratory diagnostic, ... Vietnam will evolve its processes to enhance capability, efficiency, quality and develop new vaccines and biologicals in order to meet the increasing demand of the country.

Vietnam will enter the new millennium with a strong position to improve the health of the Vietnam people.





*Thank you!*